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RECORD OF REVISIONS

Rev	Date	Description	POC	RM
0	8/16/04	Initial issue.	Kelly Bingham, <i>FWO-DECS</i>	Gurinder Grewal, <i>FWO-DO</i>
1	5/18/05	Added Para. 4.1.F, added management assessments; modified 5.2.B.	Kelly Bingham, <i>ENG-DECS</i>	Gurinder Grewal, <i>ENG-CE</i>
2	2/1/06	Added weld inspection doc reqt's (5.6, 5.8, Att 3). OST became ISD 342-1.	Kelly Bingham, <i>ENG-DECS</i>	Mitch Harris, <i>ENG-DO</i>
3	5/17/06	Referred to 1-01 for roles & responsibilities (4.1.A). Modified Section 6 to clarify requirements to procure welded items or services.	Kelly Bingham, <i>ENG-DECS</i>	Mitch Harris, <i>ENG-DO</i>

Contact the Welding Standards POC for upkeep, interpretation, and variance issues

Section 1-02	<u>Welding POC / Committee</u>
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GWS 1-02 ADMINISTRATIVE CONTROL OF WELDING & BRAZING

1.0 PURPOSE & SCOPE

- A. This procedure defines the administrative controls for the LANL Welding Program for compliance with engineering drawings and specifications, applicable codes and standards, and contract requirements.
- B. This procedure applies to all welding activities performed by LANL, SSS, and subcontractors at LANL as invoked by contract documents, in accordance with Reference 1.

2.0 REFERENCES

- 1. GWS 1-01, Introduction and Scope
- 2. GWS 1-03, Welding and Brazing Material Procurement and Control
- 3. GWS 1-05, Welder Certification by Performance Qualification Test
- 4. IMP 300-00-00, Integrated Work Management for Work Activities

3.0 ACRONYMS AND DEFINITIONS

Acronym / Term	Description
AWS-CWI	American Welding Society, Certified Welding Inspector
Codes and Standards	National consensus standards / requirements adopted by LANL for system construction and occupancy, administered for the protection of the public, worker, and environment (e.g., health, safety, and welfare. As used herein, codes include, for example, ASME, AWS, API, and AWWA standards
Non-Code Welding	Welding that does not require compliance to a national consensus code, where based on the service and usage, failure of the weld or joint would not result in serious consequences or result in a safety hazard. The WPA in conjunction with the engineer-of-record for Programs and Projects is responsible for specifying non-code welds and has the option to specify the appropriate level of weld inspection.
Nondestructive Examination (NDE)	An examination process conducted to detect internal or surface defects in materials using techniques that do not damage or destroy the item being tested. The most common types of NDE are radiography (RT), ultrasonic (UT), magnetic particle (MT), and liquid penetrant (PT) methods. Depending on the applicable code, visual examination (VT) may also require control as an NDE process.
Post Weld Heat Treatment (PWHT)	The process of removing or reducing residual stresses in welds using heat applied in accordance with an approved procedure.
Project	Work to be accomplished that includes welding.
IQMG	Institutional Quality Management Group of the LANL QA Division
Subcontractor	A legal entity that assumes by contract, obligations for delivery of a specified scope of work (product or service). As used herein, the term includes vendor, equipment vendor, fabricator, or constructor, and their sub-tier suppliers.

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Acronym / Term	Description
Welder	Within the LANL Welding Program, the term Welder also applies to welding operator, brazer, and brazing operator, as appropriate to the context of use.
WFP	Welding Fabrication Procedure (see Welding Standards, Vol. 2)
WPA	[LANL] Welding Program Administrator
WTS	Welding Technique Sheet (see Welding Standards, Vol. 4)

4.0 GENERAL

4.1 Roles and Responsibilities

See GWS 1-01.

5.0 PROCEDURE

5.1 Program Implementation

- A. Welding, nondestructive examination, and post weld heat treatment activities, including requirements for welding procedures, weld material procurement and control, and welder qualification, shall be in accordance with the LANL Welding Program, applicable codes and standards, engineering specifications, and contract requirements.
- B. ASME “Code Stamped” Vessels and Piping only: Welding activities within the scope of the ASME Boiler and Pressure Vessel Code (Section I; Section III Divisions 1, 2, or 3; Section IV; Section VIII Divisions 1, 2, or 3; or Section X) or National Board Inspection Code (NBIC) shall be accomplished in accordance with the appropriate Subcontractor’s ASME Quality System Manual and corresponding Certificate(s) of Authorization.

5.2 Welding Procedures

- A. All welding performed within the Program scope as identified in GWS 1-01 by or for LANL shall be performed using pre-qualified, qualified or ANSI Standard welding procedure specifications. The qualification of LANL welding procedures shall be in accordance with GWS 1-04, *Welding Procedure Qualification Tests and Records*, of this program.
- B. Assignment of Welding Procedure Specifications for Safety Class, Safety Significant, ML-1, and ML-2 work activities shall be approved by an AWS Certified Welding Inspector or SME authorized by the ENG WPA.

Guidance Note: Generally, a test will be administered to determine SME qualification.

- C. For all other project or program applications the responsible Manager or designated Supervisor / Engineer shall review the applicable drawings, specifications, and materials to be welded to ensure appropriate welding procedures specifications are available to cover the work. If necessary, a new welding procedure specification shall be requested in accordance with GWS 1-02, *Preparation and Control of LANL Welding Standards*, and GWS 1-04, *Welding Procedure Qualification Tests and Records*. The WPA shall be contacted to resolve welding procedure questions.
- D. Subcontractor welding procedures shall comply with requirements of GWS 1-09, *Control of Subcontracted Welding*.

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- E. Welding procedure specifications qualified by organizations in support of previous work at LANL must be reviewed and approved by the LANL WPA. Welding Procedure Specifications determined acceptable by the WPA need not be re-qualified for use within the LANL Welding Program.

5.3 Welder Performance Qualification/Certification

- A. All welding performed, within the scope as identified in GWS 1-01, by or for LANL, shall be performed by welders that are currently certified, having completed testing and qualification in accordance with GWS 1-05, *Welder Performance Qualification / Certification*.
- B. Welders performing exempted (non-code) work shall pass one or more of the standard tests for the welding process(es) they use as listed in GWS 1-05, *Welder Performance Qualification / Certification* Attachment 2, Index of Qualification Tests, or as determined by the WPA.¹
- C. The responsible Manager / Supervisor / Engineer shall assure that each welder assigned to weld on a facility, project, or program has been certified in accordance with GWS 1-05, *Welder Performance Qualification / Certification*.
- D. The responsible LANL or SSS (facility, project, or program) Manager / Supervisor / Quality Assurance or Quality Control Representative shall periodically review welder certifications to ensure welders maintain their qualifications. Welders shall be re-certified as required by the applicable codes and standards and GWS 1-05, *Welder Performance Qualification / Certification* of this program.

5.4 Weld Material Procurement, Receipt, Issue, and Control

- A. Procurement, receiving, issue, and control of welding materials shall be in accordance with GWS 1-03, *Welding and Brazing Material Procurement and Control*.

5.5 Field Welding Control

- A. Upon receipt of the engineering drawings and specifications the Project or SSS Manager shall issue the documents to the responsible work Supervisor / Engineer. The Supervisor / Engineer shall coordinate with the assigned project or designated quality assurance or quality control representative for preparation of Attachment 1, *Weld Tracking Chart* for welds requiring NDE or PWHT. The form shall be used for identification of the welding procedure, assignment of required inspection points, and documentation of completed welding control and inspection / NDE activities.
- B. Field drawings, sketches, isometrics, weld maps, etcetera shall be used to identify and document inspection and process control procedures and activities. Code-governed welds shall be identified with the welder's identification symbol in accordance with GWS 1-05. For welds not requiring PWHT or NDE (except VT), required inspections and process control activities shall be identified, controlled, and documented on a field drawing / sketch. Unless otherwise specified, the welder's symbol may be stenciled, stamped, or marked next to the weld or identified on documentation traceable to the weld. Weld maps or sketches, when authorized by engineering, may be used for weld traceability. Subcontractors shall be required to identify their welds in accordance with applicable code requirements and contract documents.

¹ Ref. LANL Director desires per 6-10-2003 meeting (EMref-32), DIR-04-227 draft (EMref-35), 7/22/04 All Hands Meeting (EMref-31), and e-mails from Jim Angelo, PS-DO (EMref-34)

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- C. The responsible Supervisor/Engineer shall requisition craft or Laboratory welding personnel, as necessary, and coordinate with the responsible LANL or SSS (facility, project, or program) QA/QC Representative, on the number of welders to be qualified, and the applications / welding processes to which the welders will be assigned.
- D. The responsible and qualified Supervisor/Engineer, AWS CWI, or WPA-qualified equivalent shall monitor weld joint fit-up, production welding activities, and PWHT operations to ensure conformance to applicable specifications and drawings.
- E. The responsible Project representative or LANL or SSS (facility, project, or program) QA/QC Representative shall conduct inspections and verifications in support of required welding program activities. Note: Additional welding requirements may be included in the project-specific welding procedures or Welding Technique Sheets (WTS).

5.6 Welding Inspection and Surveillance

- A. Visual or NDE inspection of code welds shall be performed by a LANL Approved AWS/CWI, or WPA-qualified equivalent, in accordance with specified code and standards; design documents; and GWS 1-11, *Visual Welding Inspection and NDE Qualification*.
 - a. Welding Inspections required by consensus codes and standards shall be documented. (reference Attachment 3: Welding Inspection Report) Welding Inspection Reports shall identify at least the following:
 - i. Acceptance/rejection as based on the criteria specified by the design documents
 - ii. Code or Standard used for acceptance and class, category, or service
 - iii. Record attributes inspected and severity from 0 to 4 (0=none, 1= trace, 2= minor, 3= marginal, 4=rejectable)
 - iv. Identification and location of welds inspected
 - v. Name & Date of person who performed the inspection
 - vi. Inspectors qualification level
- B. Non-Code: Visual examinations of non-code welds may be performed by the welder or responsible supervisor. Verification and close-out of non-code welding packages may be by the welding foreman or responsible supervisor.
 - a. Welding Inspections, when required, shall be documented. (reference Attachment 3: Welding Inspection Report) Welding Inspection Reports shall identify at least the following:
 - i. Acceptance/rejection as based on the criteria specified by the design documents
 - ii. Criteria used for acceptance
 - iii. Record attributes inspected and severity from 0 to 4 (0=none, 1= trace, 2= minor, 3= marginal, 4=rejectable)
 - iv. Identification and location of welds inspected
 - v. Name & Date of person who performed the inspection
 - vi. Inspectors qualification level
- C. NDE: Nondestructive examination of welds shall be performed in accordance with Subsection 5.8.

5.7 Welding Documentation

- A. The following documentation, when completed, shall be forwarded to the responsible Facility / Program / Project or SSS, QA/QC Representative for review and acceptance. Records shall be maintained by appropriate and authorized project management.

- Copies of Welding Procedure Specifications or Weld Technique Sheets.
- Weld Data Records / Field Drawings / Sketches / Weld Maps
- Welding inspection records
- NDE records, including radiographs
 - PWHT records
 - Weld Tracking Charts (Attachment 1)

Guidance Note: Welder Qualification/Certification Records and original WPSs, WFPs, and/or WTSs are maintained by the WPA.

- B. Upon Facility / Program / Project or SSS, QA/QC acceptance, completed welding documentation shall be forwarded to the responsible Facility, Project, or Program Manager for retention in accordance with LANL or SSS records management requirements.
- C. Subcontractor welding records shall be processed in accordance with contract requirements. As a minimum, the records required by this procedure, or equivalent documentation from the subcontractor's program, shall be required.
- D. Welding documentation may be maintained in hard copy and or electronic format. Records shall include the minimum information required by procedure, and shall be identifiable, legible, and retrievable.

5.8 Nondestructive Examination (NDE)

- A. The responsible and qualified Facility / Program / Project or SSS, QA/QC Representative shall monitor the performance of NDE to ensure compliance with engineering requirements and applicable codes and standards. NDE controls shall include reviews to ensure the following.
1. NDE equipment is correct, functional, appropriately calibrated and NRTL (Nationally Recognized Testing Laboratory) listed or approved by an ESO if not NRTL listed.
 2. Radioactive materials licenses and registrations for proposed radiation producing devices are correct and current.
 3. Performance of NDE at the work site is correct, complete and safe in accordance with applicable codes, standards and engineering specifications.
 4. Correct use of barricades, warning signs and radiation monitoring devices during field radiographic operations.
 5. Records of Welding Inspection are documented and identify the following:
 - i. Acceptance/rejection based on the criteria specified by the design documents
 - ii. Code or Standard used for acceptance and class, category, or service
 - iii. Record attributes inspected and severity from 0 to 4 (0=none, 1= trace, 2= minor, 3= marginal, 4=rejectable)
 - iv. Identification and location of welds inspected
 - v. Name & Date of person who performed the inspection

- vi. Inspectors qualification level
- B. Personnel performing and interpreting NDE results shall be qualified and certified as Level II or Level III (SNT-TC-1A or CP-189) in the appropriate NDE method.
- C. NDE subcontractors shall be approved in accordance with LANL procurement procedures prior to the start of NDE activities. As a minimum, NDE subcontractors shall have an approved procedure (written practice) for qualification and certification of NDE personnel in accordance with the American Society for Nondestructive Testing (ASNT) SNT-TC-1A or CP-189 document, as required by the code of construction. Subcontractor NDE procedures and personnel qualification records shall be forwarded to the LANL WPA and IQMG for retention in LANL files.
- D. The responsible and qualified Facility/Program/Project or SSS QA/QC Representative shall review NDE reports and radiographic film interpretations for acceptance. Review shall ensure that reports, radiographic film quality, and final weld quality meet the requirements of the specification and the applicable code. Radiographic film should be stored in accordance with Attachment 2 where applicable.
- E. The responsible and qualified Facility/Program/Project or SSS QA/QC Representative shall track weld reject rates. Weld reject rates shall be calculated based on linear inches of weld radiographed and rejected unless other methods of calculation are required by the specification or contract. Reports shall be distributed to the affected Project/Program or Facility Operations Director for action as may be appropriate.

5.9 Post Weld Heat Treatment

- A. Post weld heat treatment operations at LANL shall be performed in accordance with engineering specifications; applicable codes and standards; and GWS 1-08, *Post Weld Heat Treatment*.

5.10 Welding/Brazing and Thermal Cutting Safety

- A. All onsite welding, brazing, and thermal cutting is subject to the requirements of Welding, Cutting and other Spark or Flame-Producing Operations as delineated in LIR 402-840-01.

Guidance Note: GWS 1-10 Attachment 2, "Guidance Matrix for Welding Safety Training," provides guidelines to identify required welding safety training as related to welder certification.

6.0 PROCUREMENT OF WELDED ITEMS

- A. When the safety of LANL personnel, the public, or the environment are potentially at risk from a weld failure, the requester is responsible for ensuring that the procurement specification includes the necessary provisions to ensure offsite and onsite welding is performed properly.
- B. Requestors must follow LANL requirements for a quality procurement – i.e., fill-out and attach an 838c Procurement Quality Assurance Requirements form ([SUP-1 Form 838c](#)) and check the Special Processes box under Certification and Documentation. Depending on the complexity and importance, also check other applicable boxes and specify requirements. These may include requirements stating the applicable design, code, or standard (e.g., AWS, ASME B&PV Code, ASME B31 series, API, AWWA, etc.), and ensuring use of qualified procedures and personnel, using controlled filler material, and having the necessary inspection by qualified LANL or independent third party personnel.

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- C. Safety Class, Safety Significant, ML-1, and ML-2 items typically require use of suppliers from the IQMG Institutional Evaluated Supplier List (IESL) <http://ps.lanl.gov/source/orgs/ps/ps1/set.shtml> and/or use of a commercial grade dedication process (e.g., [ISD 330-10](#)).
- D. Refer to ISD [840-1](#), Procurement Quality, for more information on procurement.
- E. See also GWS 1-09 for subcontracted/procured welding.
- F. *Guidance: Assistance with welding and inspection specification is available from LANL Facility Management and Engineering Division (DES Group) and the WPA.*

7.0 ATTACHMENTS

Attachment 1: Weld Tracking Chart

Attachment 2: Recommended Practice for Storage of Processed Radiographic Film

Attachment 3: Weld Inspection Record